GeoGebra Exam Stick

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Introduction

The GeoGebra Exam Stick is a full operating system containing GeoGebra to be used in an exam environment. It has the following benefits:

- It can be used on laptops or desktops without modifying the content of the computer.
- It fits on a normal sized USB stick since the full size is 1.4 GB.
- It contains the latest GeoGebra version available at the time of creating the ISO. (Both GeoGebra 5 and GeoGebra 6 Classic are included.)
- The USB contains detailed documentation on using GeoGebra as well.
- The student's work is saved to a folder which is invisible for other students, thus it is impossible to cheat during the exam by interchanging data electronically.
- The student's work is retrievable later by the teacher on another machine. The work can be identified by a folder according to the date of examination.
- The USB stick is generated by a free set of software tools, including Debian Live. This assures the long term availability and continuous improvement of GeoGebra Exam Stick.

The USB stick is a result of a joint work of several universities, colleges and high schools worldwide, including

- <u>University of Applied Sciences and Arts, Northwestern Switzerland, FHNW</u>
- Johannes Kepler University Linz, Austria, JKU

How to use it

Preparation of the GeoGebra Stick

- 1. Download and install VirtualBox (free) from <u>https://www.virtualbox.org/wiki/Downloads</u>. Also download and install VirtualBox Extension Pack.
- 2. Download GeoGebra Exam Stick from http://download.geogebra.org/geogebrastick/:
 - a. geogebra-stick.iso GeoGebra including all goodies
 - b. geogebra-stick-no_cas.iso GeoGebra without CAS view
 - c. geogebra-stick-no_3D.iso GeoGebra without 3D view
 - d. geogebra-stick-no_cas-no_3D.iso GeoGebra without CAS and 3D view
- 3. Create a virtual machine in VirtualBox and mount the GeoGebra Exam Stick.
- 4. Start the operating system by booting the system from the mounted drive.
- 5. Clone the operating system to one or more pendrives.

Use during Exams

1. Share the pendrives among the students.

- 2. Boot the pendrive on each student computer.
- 3. Students should solve the exam exercises. When then they are finished with the solving or the time is over, the computer should be shut down and the pendrives must be collected by the teacher.

Evaluation

- 1. The teacher can read the content of the pendrive on her own machine.
- 2. The sticks can be re-used any time in another examinations without any further changes.

Detailed help in screenshots

Preparation of the GeoGebra Stick

1. Download and install VirtualBox...

Please take the time to install both *VirtualBox* and then *VirtualBox Extension Pack* properly. On some operating systems you may need additional steps to make the extension pack work correctly, otherwise you will not be able to access the USB device and create the stick in Step 5.

Example on Ubuntu Linux (all versions from 12.04 until 18.04)

- Install VirtualBox by issuing the command **apt-get install virtualbox**.
- Check its version number and search for the download folder of that version. For example, on Ubuntu 18.04 the correct folder is <u>http://download.virtualbox.org/virtualbox/5.2.10</u>. Download the latest file with the extension .vbox-extpack.
- Double-click on the downloaded file in a file manager and let VirtualBox install the extension pack.
- Issue the following command: **sudo usermod -aG vboxusers** *your_name* where *your_name* stands for your user name.
- Reboot your machine.
- 3. Create a virtual machine...

Start VirtualBox. Note: The following screenshots were taken on a Linux version of VirtualBox thus they may differ a little bit from the look of your actual installation.



Click on New, then on Next.



Fill in the form as follows.

🙁 🗊 Create New Virtual Machine			
VM Name and OS Type			
	Enter a name for the new virtual machine and select the type of the guest operating system you plan to install onto the virtual machine.		
	The name of the virtual machine usually indicates its software and hardware configuration. It will be used by all VirtualBox components to identify your virtual machine. Name GeoGebraStick Cloner		
	OS <u>Type</u> Operating <u>System</u> : Linux <u>V</u> ersion: Debian		
	< <u>B</u> ack <u>N</u> ext > Cancel		

Now click **Next** and set **Base Memory Size**. At least 1024 MB is recommended for older versions of GeoGebraStick, and at least 2048 MB is recommended for recent versions (however, VirtualBox suggests using 384 MB at least). Then click on **Next**.

😕 🗊 Create New Virtual Machine	
Additional and the initial and) in megabytes to be allocated to 384 MB. 2048 MB 10240 MB
< Back Next > Cancel	Back Next > Cancel

Now leave settings for the Virtual Hard Disk as they are and click **Next** again.

Virtual Hard Disk
If you wish you can now add a start-up disk to the new machine. You can either create a new virtual disk or select one from the list or from anothe location using the folder icon.
If you need a more complex virtual disk setup you can skip this step and make the changes to the machine settings once the machine is created.
The recommended size of the start-up disk is 8.00 GB.
Start-up Disk
C Use existing hard disk
Empty

Use the default settings at the next screen again and click on Next.

🛞 🗊 Create New Virtual Disk			
	Welcome to the virtual disk creation wizard		
	This wizard will help you to create a new virtual disk for your virtual machine.		
	Use the Next button to go to the next page of the wizard and the Back button to return to the previous page. You can also press Cancel if you want to cancel the execution of this wizard.		
Please choose the type of file that you would like to use for the new virtual you do not need to use it with other virtualization software you can leave setting unchanged.			
	_ File type		
	VDI (VirtualBox Disk Image)		
	C VMDK (Virtual Machine Disk)		
	C VHD (Virtual Hard Disk)		
	C HDD (Parallels Hard Disk)		
	< <u>B</u> ack <u>Next</u> > Cancel		

Do the same at the next sceen as well.

Virtual disk storage details	
Please choose whether the new virtual disk file should be allocated as it is used or if it should be created fully allocated.	
A dynamically allocated virtual disk file will only use space on your physical hard disk as it fills up, although it will not shrink again automatically when space on it is freed.	
A fixed size virtual disk file may take longer to create on some systems but is often faster to use.	
Storage details	
Dynamically allocated Fixed size	
< <u>Back</u> <u>Next</u> Cancel	

Again, do the same.

😣 🗊 Create New	Virtual Disk
	Virtual disk file location and size Please type the name of the new virtual disk file into the box below or click on the folder icon to select a different folder to create the file in. Location GeoGebraStick Cloner Select the size of the virtual disk in megabytes. This size will be reported to the Guest OS as the maximum size of this virtual disk. Size 4.00 MB 2.00 TB
	< Back Next > Cancel

Finally you get the last screen and you must choose **Create** (twice, since the Summary will be shown again, not shown in this tutorial).

Summary

You are going to create a new virtual disk with the following parameters:

File type: VDI (VirtualBox Disk Image) Details: Dynamically allocated storage Location: /home/GeoGebra/VirtualBox VMs/GeoGebraStick Cloner/GeoGebraStick Cloner.vdi

If the above settings are correct, press the **Create** button. Once you press it the new virtual disk file will be created.

< Back

Create

Cancel

Now you will see the freshly created virtual machine in the VirtualBox window.



*

-

Click on **Storage** to add the downloaded GeoGebra Exam Stick .iso by choosing **Storage Tree > IDE Controller > Empty** and click on the disk icon on the top right corner of the window.

😣 🗊 GeoGebraSt	ick Cloner - Settings	
 General System Display Storage 	Storage Storage Tree IDE Controller	Attributes CD/DVD <u>D</u> rive: IDE Secondary Mi 💌 😥
 Storage Audio Network Serial Ports USB Shared Folders 	 ☑ Empty ☑ SATA Controller ☑ GeoGebraStick Cloner.vd 	☐ Live CD/DVD Information Type: Size: Location: Attached To:
	Choose a virtual CD/DVD disk or a p The virtual machine will see a disk in file or on the disk in the physical dri	hysical drive to use with the virtual drive. nserted into the drive with the data in the ve as its contents.

Now click on Choose a virtual CD/DVD disk file... and select the downloaded .iso file.

🔕 🗊 Choose a virtual CD/DVD disk file			
Look in: home/GeoGebra 🖸 O O	🖾 🗉		
Computer GeoGebra VirtualBox VMs Geogebra-stick-no 3D-2014-09-25.iso			
File name: geogebra-stick-no_3D-2014-09-25.iso	<u>O</u> pen		
Files of type: All CD/DVD-ROM disk images (*.dmg *.iso *.cdr)	Cancel		

Now click **Open** and the .iso file must have been inserted as a virtual DVD disk to be used for the virtual machine.

😣 🗈 GeoGebraSt 📃 General	ick Cloner - Settings Storage	
 System Display Storage Audio Network Serial Ports USB Shared Folders 	Storage Tree	Attributes CD/DVD Drive: IDE Secondary Mi Live CD/DVD Information Type: Image Size: 1.19 GB Location: /home/GeoGebra/geog Attached To:
	Select a settings category from the mouse over a settings item to get n	list on the left-hand side and move the nore information.

Now click **OK**.

If you use VirtualBox 5 you should enable **System** > **Processor** > **Enable PAE/NX**, otherwise the GeoGebraStick system will not boot properly.

4. Start the operating system...

At this point VirtualBox is ready to start the virtual machine which is able to boot the GeoGebra Stick .iso as a virtual DVD, and then this virtual DVD can be cloned by the automatically started **Storage media management application** (see below).

To start the virtual machine and boot from the virtual DVD, you must press the Start button first.

😣 🖨 💿 🛛 Oracle VM VirtualBox Manag	er	
<u>File Machine Help</u>		
New Settings		Details Inapshots
GeoGebraSt <mark>Start</mark> loner	📃 General	Preview
Wered Off	Name: GeoGebraStick Cloner OS Type: Debian	
	System	GeoGebraStick
	Base Memory: 2048 MB Boot Order: Floppy, CD/DVD-ROM, Hard Disk Acceleration: VT-x/AMD-V,	Cioner
	Display	
	Video Memory: 12 MB Remote Desktop Server: Disabl	led
	Storage	
	IDE Controller IDE Secondary Master (CD/DV SATA Controller SATA Port 0:	/D): geogebra-stick- no_3D-2014-09-25.iso (1.19 GB) GeoGebraStick Cloner.vdi (Normal, 8.00 GB)
	De Audio	<u>.</u>
Start the selected virtual machine		

You may safely ignore any information popup window shown by VirtualBox. (There may be multiple information windows about various minor problems. Just click **OK** to ignore them.)

8 V	'irtualBox - Information		
•	You have the Auto capture keyboard option turned on. This will cause the Virtual Machine to automatically capture the keyboard every time the VM window is activated and make it unavailable to other applications running on your host machine: when the keyboard is captured, all keystrokes (including system ones like Alt-Tab) will be directed to the VM.		
	You can press the host key at any time to uncapture the keyboard and mouse (if it is captured) and return them to normal operation. The currently assigned host key is shown on the status		
	bar at the bottom of the Virtual Machine window, next to the icon. This icon, together with the mouse icon placed nearby, indicate the current keyboard and mouse capture state.		
	The host key is currently defined as Right Ctrl .		
	Do not show this message again		
	OK N		

Now GeoGebra Stick starts in a window in VirtualBox. (From now on VirtualBox menus shown on the top of the screenshots are in black background in this tutorial.)

Ge&Gebra

Menu		
Oesterreich		
Deutschland		
(English)		
	😫 🕀 🖉 🗬 🥅 🔟 🖉 🕅 Right	t Ctrl

You can select the required country or language right after starting the virtual machine: this will affect the language of the operating system of the stick and also GeoGebra. You can use the arrow keys and the ENTER key. You have 5 seconds to choose. After 30 seconds of any kind of action the currently chosen menu item will be started.



😂 🔂 🖉 🖶 🛄 🚺 🔇 🖉 Right Ctrl

The system startup is shown in 5 steps. Depending on the speed of your computer the startup process takes more or less time. Finally the KDE desktop environment (see icon "K" above) will be shown in full functionality.



In this documentation an older version of the stick were used to generate screenshots. However, the desktop icons in the latest versions of the GeoGebraStick system will look a bit differently:



5. Clone the operating system...

Now automatically the window **Storage media management** will be shown to start cloning GeoGebra Exam Stick to a pendrive.



Before continuing, you need to ensure that a pendrive is inserted and it is activated for using with VirtualBox. This can be achieved outside the GeoGebra Exam Stick, in menu **Devices** > **USB Devices**. Each activated device is shown by a checked checkbox before it after clicking by the mouse pointer on the name of the device in the menu list. It is important that you need to unmount the pendrive first in the main operating system you normally use, otherwise it will not be listed in the menu. (For example, under Linux you may need to eject the pendrive if you can see any former content of it in the host operating system.)



Now you may see in the right bottom part of the desktop window the current content of the pendrive for some seconds, then the information text will disappear.

Then click on the button **Install system on storage** media inside the GeoGebra Exam Stick window.



Now click **Next**. If your pendrive is successfully detected by VirtualBox then you should see that step "2. Selection" is activated in the left part of window and a suggested partitioning is also shown.

Storage mea	a management	_ 0				
Steps	Please select the tar (Multiple selections with (Minimum require	get storage media :trl+left mouse button) show hard disks d size: 1.2 GiB				
2. Selection	Number of selected storage media: 1	Number of selected storage media: 1				
5. Installation	Proposed partitioning of JetFlash TS2GJFT3, 1.9) GiB (/dev/sdb)				
	100 MiB 506.5 MiB	1.2 GiB				
	Size 0 50 100 150 200 250 Label Exchange Pattern	300 350 400 450 500 550 600 ing Start value 1: Increment 1:				
	File system FAI32	opy exchange partition				
		Previous 🕢 Next				

Since you want to save the students' work automatically to the Exchange partition, you need to set its size to greater than zero. So please move the slider on the bottom and set the size of the Exchange partition to say 100 MiB. (GeoGebra files are usually much smaller. Maybe you want your students to make screenshots about their work, so they will want to use the Screenshot application and also LibreOffice Writer to put the images into a single document. But 100 MiB will still be plenty of storage for most cases.) In the case of using a different language than English, the **Label** of the Exchange partition may differ, this is not a problem, you can choose any label, it is irrelevant.

Now you can click **Next**. You should see a Warning window to confirm deleting the previous content of your pendrive. Click **Yes** to do so.

Now the cloning starts and it will take about 10-15 minutes depending on the speed of computer.

📚 💿 Storage medi	a management				
Steps	Current installation Installation report				
1. Information	Installing system on JetFlash TS2GJFT3 1.9 GiB (/dev/sdb, 1 of 1)				
2. Selection					
3. Installation					
	Granting file systems				
	creating me systems				
	Previous Next				
	United Stream				

The cloning will consist of two parts. First the file systems are created. Then the files are copied from the source media to the target.

Steps Current installation Insta	llation report	
1. Information Insta	lling system on JetFlash TS2GJFT3 1.9 GiB (/dev/sdb,	1 of 1)
2. Selection		
3. Installation		
	Copying files	
05:49	10:55	05:06
613 MB	1.1 GB 53% (1.8 MB/s)	537 MB
8:32:10 AM		8:43:05 AM
		Previous Next

When the process finishes another window appears.

Steps 1. Information 2. Selection 3. Installation Installation Installation Image: Steps Image: Steps	💊 💿 Storage media	a management										X
Number Device Vendor Model Serial Number Size Duration Status 1 //dev/sdb jetFlash TS2GJFT3 2ABT490E 1.9 G/B 12:12:38 AM OK	Steps 1. Information 2. Selection 3. Installation	Congratulations! Installation finished. You can now safely remove the newly created storage media. You may copy the system to other storage media drives by pressing the "Previous" button. If you are done you may exit the program by pressing the "Done" button.										
1 //dev/sdb jetFlash TS2GJFT3 2ABT490E 1.9 GIB 12:12:38 AM OK	Similation	Number	Device	Vendor	Model	Serial Number	Size	Duration	Status	1		-
		1	/dev/sdb	JetFlash	TS2GJFT3	2ABT490E	1.9 GiB	12:12:38 AM	OK	-		4
										Revious		ne

Now you can safely quit GeoGebra Exam Stick via the VirtualBox menu **Machine** > **Quit...** > **Power off the machine** and you are ready to use the pendrive on another machine.

The system on the pendrive is the same as when started in VirtualBox with the following differences:

- There will be no Internet connection. Thus GeoGebra cannot connect to GeoGebraTube.
- The Storage media management software will not start.

Use during Exams

- 2. Boot the pendrive...
 - If you use a Mac, hold on the **Option** key (or the **Alt** key if you use a PC keyboard) during switching the machine on and select one of the **EFI Boot** options which appear as last items of the list.

je j				V	V
Macroson Ho	HECOVERY-12.8.4	EFi Boot	Recovery-10.9	Whows	EFIBOR
			•		•
		Choose Netw	iork 🤪		

- If you use an *older* PC, take the time to carefully read
 - <u>http://pcsupport.about.com/od/tipstricks/ht/bootusbflash.htm</u> to get help. PCs may have different ways to boot the pendrive, so you may need additional time in finding out how you can enter the boot menu and change the boot order. (There is plenty of Internet resources on this topic.) It is very important to

try out USB booting in advance before the exam for each kind of student laptop. *Note: some very old machines may not support USB booting at all.*

- If you use a *recent* PC (for example a new laptop or netbook), you may need to boot the stick as follows. If you use Windows 8.1, make sure that you insert the stick when you switch your computer on. Then when logged in:
 - a. Click on the Start icon on the bottom-left corner.
 - b. Swipe in from the right and then tap **Settings**. (If you're using a mouse, point to the upper-right corner of the screen, move the mouse pointer down, and then click Settings.)
 - c. Tap or click Change PC Settings.
 - d. Tap or click **Update and recovery** (which is the last option), and then tap or click **Recovery** (which is the last option, again).
 - e. Under **Advanced Startup** (which is the last option, again), tap or click **Restart now**. You may need to wait some seconds here.
 - f. On the Choose an option screen, tap or click Use a device.
 - g. You will see at least one option containing the text **UEFI : USB** which should be selected by tapping/clicking to start GeoGebraStick.

Notes for advanced users

 The Storage media management application is also available via the K menu on the bottom left of the desktop in menu Applications > System > lernstick. Please always use FAT32 for the Exchange File system since the default exFAT type is not supported and will not work.